

# Protostega

***Protostega*** ('first roof')<sup>[1]</sup> is an extinct genus of sea turtle containing a single species, ***Protostega gigas***. Its fossil remains have been found in the Smoky Hill Chalk formation of western Kansas (*Hesperornis* zone, dated to 83.5 million years ago<sup>[2]</sup>) and time-equivalent beds of the Mooreville Chalk Formation of Alabama.<sup>[3]</sup> Fossil specimens of this species were first collected in 1871, and named by Edward Drinker Cope in 1872.<sup>[4]</sup> With a length of 3 metres (9.8 ft), it is the second-largest sea turtle that ever lived, second only to the giant *Archelon*,<sup>[5]</sup> and the third-largest turtle of all time behind *Archelon* and *Stupendemys*.<sup>[6]</sup>



*Protostega* skeletal reconstruction in the Rocky Mountain Dinosaur Resource Center, Woodland Park, Colorado

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## Discovery and History



Protostegids family locations

of *Protostega gigas* in the Kansas chalk in 1871. A variety of bones were found in yellow cretaceous chalk from a bluff near Butte Creek.<sup>[8][9]</sup>

## Paleoenvironment

**Protostega**

**Temporal range:** Late Cretaceous, 83.5 Ma

PreЄ   Є   OS   D   C   P   T   J   K   PgN

Mounted skeleton

**Scientific classification**

Kingdom:     Animalia

Phylum:     Chordata

Class:     Reptilia

Order:     Testudines

Suborder:     Cryptodira

Family:     †Protostegidae

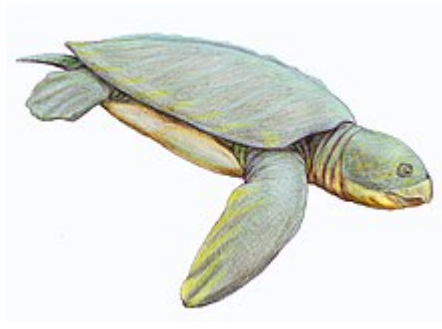
Genus:     †*Protostega*  
Cope, 1872

**Type species**

†***Protostega gigas***  
Cope, 1872

The first known *Protostega* specimen (YPM 1408) was collected on July 4 by the 1871 Yale College Scientific Expedition, close to Fort Wallace and about 5 months before Cope arrived in Kansas. However the fossil that they found was never described or named.<sup>[7]</sup> It wasn't until E. D. Cope found and collected the first specimen

The Late Cretaceous was marked by high temperatures, with large epicontinental seaways.<sup>[10]</sup> During the Mid-to Late Cretaceous period the Western Interior Seaway covered the majority of North America and would connect to the Boreal and Tethyan oceans at times.<sup>[11][12]</sup> Within these regions are where the fossil of *Protostega* *gigas* have been found.<sup>[13]</sup>



Pencil restoration

## Description

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*Protostega* is known to have reached up to 3 meters in length.<sup>[2]</sup> Cope's *Protostega gigas* discovery revealed that their shell had a reduction of ossification that helped these huge animals with streamlining in the water and weight reduction.<sup>[14]</sup> The carapace was greatly reduced and the disk only extending less than half way towards the distal ends of the ribs. Cope described other greatly modified bones in his specimen including an extremely long coracoid process that reached all the way to the pelvis and a humerus that resembled a *Dermochelys*.<sup>[15]</sup>

<sup>[15]</sup> Creating better movement of their limbs.

**Skull Structure:** Edward Cope described the unique *Protostega gigas* to have a large jugal that reached to the quadrate along with a thickened pterygoid that reached to the mandibular articulating surface of the quadrate.<sup>[16]</sup> The fossil featured a reduction in the posterior portion of the vomer where the palatines meet medially.<sup>[16]</sup> Another fossilized specimen showed a bony extension, that would have been viewed as a beak, was lacking in the *Protostega* genus.<sup>[7]</sup> The premaxillary beak was very shorted then *Archelon*.<sup>[15]</sup> In front of the orbital region was elongated with broadly roofed temporal region. The jaws of the fossil showed a large crushing -surfaces.<sup>[15]</sup> The quadrato-jugal was triangular with a posterior edge that was concave and the entire bone was convex from distal view. The squamosal appeared to have a concave formation on the surface at the upper end of the quadrate. In Cope's fossil the mandible was preserved almost perfectly and from this he recorded that the jaw was very similar to the *Chelonidae* and the dentary had a broad for above downward with a concave surface, marked by deep pits in the dentary.<sup>[17]</sup>



Body structure of fossilized *Protostega*

Cope concluded that these animals were most likely omnivores and consumed a diet of hard shelled crustacean creatures, due to the long symphysis of its lower jaw.<sup>[15]</sup> Along with probably consisted of seaweed and jellyfish or scavenged on floating carcasses as well, like modern turtles.<sup>[18]</sup>

## Classification

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The classification of *Protostega* was complicated at best. The specimen that Cope discovered in Kansas was hard to evaluate with the preservation condition. The fossil shared many characteristics with two other recored genus named *Dermochelys* and *Chelonidae*. Cope wrote about the characteristics that distinctly separated this particular species from the two controversial groups. The differences he described were that the fossil had a reduced or lacking amount of dermal ossification on the back, the articulation of the pterygoid and quadrates, presplenial bone in the jaw was present, no articular process on the back side of the nuchal, simple formation of the radial process on the humerus and a peculiar bent formation of the xiphiplastra. He concluded that genus *Protostega* and species *Protostega gigas* was an intermediate form of the two groups *Dermochelys* and *Chelonidae*.<sup>[17]</sup>

## See also

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- [List of Turtles](#)
- [Western Interior Seaway](#)
- [Late Cretaceous](#)

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